

**7TH ANNUAL RADIATION PROGRAM INVESTIGATORS' WORKSHOP**  
**May 14-17, 1996**  
**AGENDA**

Location: The Mission Inn, except as noted.

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**Tuesday, May 14**

9:00 AM-Noon        Registration  
1:00-2:00 PM

2:00 PM              Welcome/Opening Remarks (W. Schimmerling, J. M. Slater)

2:10 PM              Introduction and Announcements (G. A. Nelson)

**Session I              Workshop Report - Risk Management for Solar Particle Events**

Chair:        R. Turner

2:20-2:35 PM        Workshop Overview (R. Turner)

2:35-3:05 PM        Solar Particle Events -- Current Theories and Observations (A. Kiplinger)

3:05-3:35 PM        Solar Particle Event Forecasting (G. Heckman)

3:35-3:50 PM        Workshop Findings (R. Turner)

3:50-4:00 PM        Break

**Session II              Future Opportunities in Space (Platform Session)**

Chair:        W. Schimmerling

4:00-4:15 PM        Programmatic Requirements for Spaceflight Experiments (W. Schimmerling)

4:15-4:30 PM        Flight Experiments: Opportunities, Requirements and Constraints (R. Arno)

4:30-4:45 PM        Spaceflight Validation of Radiation Risk: Scientific Requirements and Approach (V. Petrov)

4:45-5:00 PM        TBD (V. Bogomolov)

5:00-5:15 PM        Spaceflight Validation of Radiation Risk: Spacecraft Design and Mission Analysis (R. Spann)

5:15-6:00 PM        Discussion

6:30-8:30 PM        Reception

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**Wednesday, May 15**

**Location: Loma Linda University Medical Center**  
(Buses to LLUMC leave Mission Inn at 8:00 AM)

**Session III Animal and Tissue Radiobiology**

Chair: L. H. Lutze-Mann

Co-chair: M. H. Barcellos-Hoff

- 8:30-8:45 AM Animal Experimentation at the Frontiers of Molecular, Cellular and Tissue Radiobiology (H. R. Warner, A. Chatterjee and M. J. Bissell)
- 8:45-9:00 AM Issues on Early Biological Response to Space Radiations in NASA-Related Programs (J. W. Wilson, F. A. Cucinotta, J. L. Shinn, T. D. Jones and C. K. Chang)
- 9:00-9:15 AM Cosmic Radiation ( $^{56}\text{Fe}$  Particles) Effects on Signal Transduction in the CNS: Implications for Immediate or Delayed Motor and Cognitive Deficits as a Function of Age (J. A. Joseph, S. Erate and B. M. Rabin)
- 9:15-9:30 AM Effects of Low and Intermediate Doses of Particulate Radiations on Long-Lived Animals: Late Stochastic and Deterministic Effects (A. B. Cox, M. A. Hanes and J. T. Lett)
- 9:30-9:45 AM Assessment of Radiation-Induced Carcinogenesis by Molecular Biomarkers: Oncogene Activation and Gene Expression (A. C. Miller, T. Whittaker, V. Srinivasan, E. P. Clark and E. J. Ainsworth)
- 9:45-10:00 AM Assessment of Radiation Damage in the Rodent Lens Epithelium Following Irradiations with 155 MeV Protons, 600 MeV/u  $^{56}\text{Fe}$ , and 250 kVp X-rays (A. L. Lindgren, A. L. Anderson, J. A. Archambeau, M. F. Moyers and E. J. Ainsworth)
- 10:00-10:30 AM Break
- 10:30-10:45 AM Effects of Heavy Ions on the DNA in the Photoreceptor Cells of the Rabbit: An Overview of Two Decades of Life Span Experiments (J. Lett and G. R. Williams)
- 10:45-11:00 AM Human Lens Epithelial (HLE) Cells: An *in vitro* Model to Assess Proton-Induced Radiation Effects (E. A. Blakely, B. S. Kaur, K. A. Bjornstad and G. Aragon)
- 11:00-11:30 AM Experimental Proton Irradiations at Loma Linda University Medical Center (M. F. Moyers, G. B. Coutrakon, D. W. Miller, J. V. Siebers, G. A. Nelson and J. M. Slater)
- 11:30-Noon Introduction to the Loma Linda University Proton Treatment Center (J. M. Slater)
- Noon-1:40 PM Lunch  
Tour of Loma Linda University Proton Treatment Center  
(Buses return to Mission Inn at 1:40 PM)

#### **Session IV**

Chair: W. Schimmerling

- 2:00-2:20 PM NCRP Report (W. Sinclair)
- 2:20-2:40 PM NRC Report (R. Setlow)
- 2:40-3:10 PM Implementation of the ALARA Principle on the Mir Station (V. Petrov)
- 3:10-4:10 PM Highlights of Radiation NSCORT Activities (A. Chatterjee)
- 4:10-4:30 PM Break

#### **Session V**

#### **Workshop Report - Shielding Strategies for Human Space Exploration**

Chair: J. Miller

- 4:30-4:45 PM Issues in Developing Shielding Strategies for Human Space Exploration (J. W. Wilson, F.A Cucinotta, M. Kim, J.L. Shinn, G.D. Badhwar, F.F Badavi and R. Katz)
- 4:45-4:55 PM Recommendations of Working Group on Materials for Space Use and Space Radiation Protection (J. W. Wilson)
- 4:55-5:10 PM Recommendations of Working Group on Shielding Materials Performance Evaluation and Testing (S. B. Curtis)
- 5:10-5:30 PM Panel Discussion

Thursday, May 16, 1996

**Session VI                    BNL AGS**

8:30-9:00 AM            **AGS and BNL-1 Overview** (J. Miller, M. Vazquez)

**BNL-1: DNA Damage and Repair; Mutation**

Chair:     A. Kronenberg

Co-Chair: B. M. Sutherland

9:00-9:15 AM            DNA Double-Strand Breaks Induced by High Energy Fe Ions. Non-Random Initial Distribution. Repair of Correct and Incorrect Ends (B. Rydberg, M. Löbrich and P. K. Cooper)

9:15-9:30 AM            Quantitation of Double Strand Breaks Induced in Human DNA by CentiGray Doses of <sup>56</sup>Fe (1GeV/nucleon) (B. M. Sutherland, P. V. Bennett and J. C. Sutherland)

9:30-9:45 AM            The Fidelity of DNA Strand-Break Repair Pathways in Human Cells (T. J. Jorgensen, M. E. Dar and T. A. Winters)

9:45-10:00 AM          Effect of p53 Status on Cell Killing and Mutation Induction Following Low Fluence Exposure to 1090 MeV/amu Fe Ions (A. Kronenberg, S. Gauny and C. Cherbonnel-Lasserre)

10:00-10:15 AM         DNA Double-Strand Break Repair and High LET Radiation-Induced Genomic Instability (D. J. Chen, B. Marrone, C. L. Limoli and W. R. Morgan)

10:15-10:30 AM         Mutagenesis by 1 GeV/nucleon Iron Particles in the Nematode *C. elegans* (G. A. Nelson, D. P. Schranck, W. W. Schubert, G. A. Kazarians, P. S. Hartman and A. Hlavacek)

10:30-10:50 AM         Break

**BNL-1: Cell, Tissue and Animal Radiobiology**

Chair:     M. Vazquez

Co-Chair: L. H. Lutze-Mann

10:50-11:05 AM         Cellular Responses to 1 GeV/u Iron Particles: Lethal and Cytogenetic Effects (T. C. Yang, H. Wu, K. George, M. Durante and L. Craise)

11:05-11:20 AM         The Effect of Exposure to Iron Ions on Different Endpoints in Transgenic Mice (L. H. Lutze-Mann, I. P. Samuels, R. A. Winegar, M. Ramsey and J. D. Tucker)

11:20-11:35 AM         High LET-Induced Microenvironment Alterations in the Murine Mammary Gland (M. H. Barcellos-Hoff, E. J. Ehrhart and E. L. Gillette)

11:35-11:50 AM         Relationship Between the Behavioral Toxicity of <sup>56</sup>Fe Particles and LET (B. M. Rabin and J. Joseph)

11:50 AM-1:00 PM       Lunch

1:00-1:30 PM            BNL-1 Biology Summary (A. Kronenberg)

## **BNL-1: Physics and Dosimetry**

Chair: J. Miller

Co-Chair: T. Borak

1:30-1:45 PM AGS Machine and Radiobiology Beamline Status (D. Lazarus)

1:45-2:00 PM AGS Radiobiology Dosimetry System - Results from October 1995 (L. Heilbronn, K. Frankel, B. Ludewigt, J. Miller, M. Nyman, R. P. Singh and C. J. Zeitlin)

2:00-2:15 PM Fragmentation Physics and Beam Characterization (C. J. Zeitlin, L. Heilbronn, J. Miller, S. E. Rademacher, T. B. Borak, T. Carter, K. Frankel, W. Schimmerling and C. Stronach)

2:15-2:30 PM Microdosimetry Measurements of 1 GeV/amu Fe Nuclei (S. E. Rademacher, T. B. Borak, L. Heilbronn, J. Miller and C. J. Zeitlin)

2:30-2:45 PM Microdosimetry Measurements of Particle Fragments from 1 GeV/amu Fe Nuclei in Thick Targets (T. B. Borak, S. E. Rademacher, L. Heilbronn, J. Miller and C. J. Zeitlin)

## **BNL-2**

2:45-3:00 PM AGS Radiobiology Facility Status (M. Vazquez, J. Miller)

3:00-3:15 PM Break

## **Session VII Space Measurements**

Chair: J. Kiefer

Co-chair: E. V. Benton

3:15-3:30 PM Repair of Radiation Damage Under Microgravity - The SMM-3 Experience (H.-D. Pross and J. Kiefer)

3:30-3:45 PM Mutagenesis Under Microgravity - A Progress Report from STS-76 (G. A. Nelson, E. V. Benton, P. S. Hartman, A. Hlavacek, G. A. Kazarians, R. G. Kern, D. P. Schranck and W. W. Schubert)

3:45-4:00 PM 3D ORAM Dosimeter for Space Radiation Environments (D. Emfietzoglou and M. Moscovitch)

4:00-4:15 PM Recent Space Radiation Measurements on the Space Shuttle and Mir Station, Including Intercomparison of Active and Passive Radiation Detectors (E. V. Benton, A. Frank, E. R. Benton, G. D. Badhwar, V. M. Petrov, Yu. A. Akatov and I. V. Tchernykh)

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4:30-6:00 PM **Users' Meeting for Current and Prospective Investigators at the BNL-AGS and LLUMC Proton Facility**

6:30-7:00 PM Cocktails

7:00-10:00 PM Banquet

**Friday, May 17**

**Session VIII Cell and Molecular Radiobiology I.**

Chair: B. M. Sutherland

Co-chair: T. C. Yang

- 8:30-9:10 AM DNA Strand Breakage and Rejoining (L. F. Povirk, X.-Y. Gu and R. A. O. Bennett)
- 9:10-9:50 AM Clusters of DNA Damage and Chromatin Structure (A. Chatterjee)
- 9:50-10:05 AM Mutation Induction by Energetic Oxygen, Neon, Nickel, Gold and Lead Ions (J. Kiefer, U. Stoll and P. Schmitt)
- 10:05-10:20 AM Measuring the Spectrum of Mutation Induced by HZE and low LET Irradiations in the Human-Hamster Hybrid Cell Line ALC (S. M. Kraemer, A. Kronenberg, A. Ueno and C. Waldren)
- 10:20-10:35 AM Molecular Characterization of 304 HPRT-deficient Mutants of Human Lymphoid Cells Arising After Low Fluence Exposures to High Energy Heavy Ions (S. Nelson, A. Grosovsky, S. Gauny, A. Chang and A. Kronenberg)
- 10:35-10:50 AM Break

**Session IX Cell and Molecular Radiobiology II.**

Chair: T. C. Yang

Co-Chair: B. M. Sutherland

- 10:50-11:05 AM Malignant Transformation of Human Bronchial Epithelial Cells by High LET Radiation  
T. K. Hei, C. Q. Piao, T. Pandita, E. J. Hall and C. Waldren
- 11:05-11:20 AM Progress on Cell-Cycle Protein Localization: Addition of DNA Damage  
Localization After Alpha Particle Traversal  
N. E. Metting
- 11:20-11:35 AM Thiolamine Modulations of Radiation-Induced Apoptosis  
R. L. Warters and J. C. Roberts
- 11:35-11:50 AM A Biophysical Model for the LET-Dependent Chromosome Exchange  
H. Wu and T. Yang
- 11:50 AM-12:05 PM A Molecular Theory for Cell-Cycle Progression and Radiation-Induced G1 Arrest as a  
Result of P53 Regulation of Cyclin Kinase Inhibitor P21 (F. A. Cucinotta, J. F. Dicello, J.  
R. Williams, J. W. Wilson and M. H. Mabry)
- 12:05-12:20 PM Impact of Biological Models on Radiation Physics Requirements in Space Radiation  
Protection (J. W. Wilson, F. A. Cucinotta, M. A. Kim and J. L. Shinn)
- 12:20-12:30 PM Closing Remarks (W. Schimmerling)
- 12:30 PM Adjourn